

1942 MANHATTAN PROJECT



J. Robert Oppenheimer

January 19 —

President **Roosevelt** approves development of an atomic bomb, whose energy will come from fissionable isotopes of **uranium** (U-235) or **plutonium** (Pu-239). Such a bomb seems possible in theory, but no one yet knows if a practical weapon can be made.

August 13 —

Manhattan Engineer District established in New York City—hence the name, **Manhattan Project**. The secret, nationwide effort to create an entirely new type of bomb formally begins.

September 17 —

General Leslie R. Groves appointed head of the Manhattan Engineer District.

October 19 —

Groves decides that a separate laboratory is needed for design and production of the weapon. He chooses **J. Robert Oppenheimer**, a theoretical physicist at the University of California, as laboratory director. (Other facilities, at **Oak Ridge**, Tennessee, and **Hanford**, Washington, will produce the nuclear materials.)

November 25 —

Consulting with Oppenheimer, Groves selects remote and isolated Los Alamos as the secret site for Project Y.

December 2 —

In Chicago, Enrico Fermi and colleagues achieve the first man-made, self-sustaining **nuclear chain reaction**, demonstrating the reality of the chain-reaction theory.

December 7 —

Notice given to **Los Alamos Ranch School** (shown here), **Anchor Ranch**, and neighboring homesteaders to vacate their property.

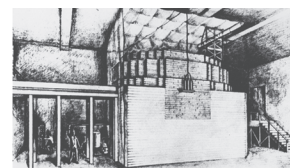


December —

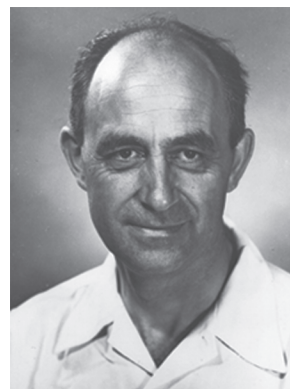
Operating under a verbal agreement, M.M. Sundt Co. begins constructing laboratory facilities.



Gen. Leslie R. Groves



Fermi and team assembled their nuclear reactor under the University of Chicago's football stadium.



Enrico Fermi



Although vastly different in temperament, Groves and Oppenheimer shared leadership skills that proved crucial to the success of Project Y.



OTOMI MILITARY RESERVATION LOS ALAMOS, N.M. VIEW SOUTHEAST HOUSE AND YARD, TRACT 16 5/26/43

Anchor Ranch (above) and the Duran homestead (below), among other properties, were made part of the new military reservation. Anchor Ranch became a test facility known as the Gun Site.



1943 MANHATTAN PROJECT

February 8 —

Ranch School students and faculty leave after an early graduation.

March 15 —

Oppenheimer, soon followed by recruited scientists, arrives in Santa Fe to set up the secret laboratory at Los Alamos.

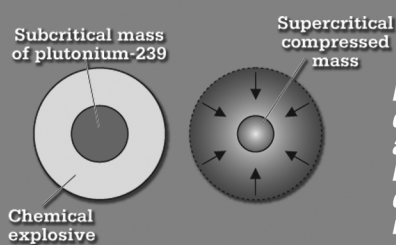
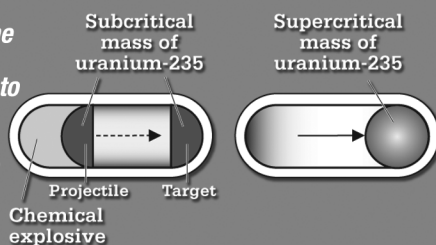
April —

Work begins. Scientists pursue the use of two different fissionable materials, uranium and plutonium, for a **gun-type** weapon. As a back-up to the plutonium gun-type weapon, Oppenheimer establishes a smaller program to explore development of a plutonium **implosion** weapon.



An office at 109 E. Palace St. in Santa Fe became the "cover" for Project Y.

In a gun-type weapon, an explosion drives one subcritical mass of fissionable material into another, forming a supercritical mass and initiating a fission chain reaction that yields the bomb's tremendous energy.



In an implosion weapon, explosives surrounding a subcritical mass of Pu-239 detonate and compress the plutonium into a critical mass, initiating a chain reaction.

Mid-April —

M.M. Sundt completes laboratories, apartments, and other facilities at Los Alamos, but housing shortages persist as the Laboratory and the population grow.

April 20 —

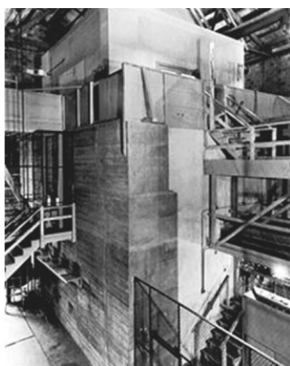
Formal beginning of the Los Alamos Laboratory: the **University of California** becomes the prime contractor operating the facility.

July 10 —

Nearly invisible speck of plutonium arrives from the Met Lab, the University of Chicago **Metallurgical Laboratory**, for testing.

July 15 —

Experiments show that Pu-239 is at least as good an emitter of neutrons—needed to produce a chain reaction—as U-235. This result supports decision to construct a giant plutonium-production plant at Hanford.



The Met Lab produced plutonium in this new version of Fermi's original reactor, built in the Argonne Forest outside Chicago. A speck was all that the laboratory, another part of the Manhattan Project, could spare.



Construction of the Hanford plant began in 1943; by 1945 it employed 55,000 workers.

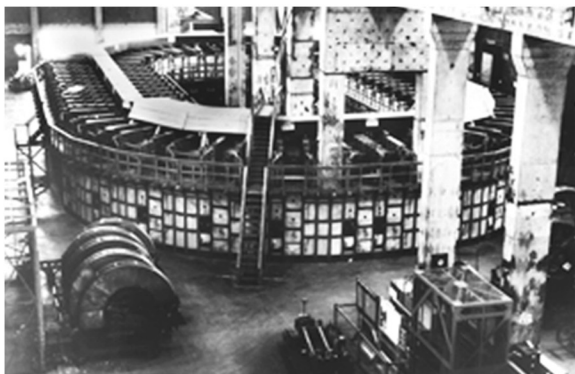
1944 MANHATTAN PROJECT

January —

Following a conceptual breakthrough, Oppenheimer directs researchers to step up the effort to design a plutonium implosion bomb.



Mathematician John von Neumann (left), shown with Richard Feynman (center) and Stanislaw Ulam, provided the key insight.



One of the "racetracks" at Oak Ridge used for electromagnetic separation of the fissionable isotope of uranium, U-235, from the nonfissionable isotope, U-238.

February —

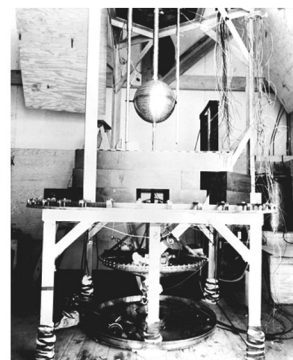
Appreciable quantities of enriched uranium—about 200 grams—arrive in Los Alamos.

March —

First reactor-made plutonium—about half a gram—arrives at Los Alamos from Oak Ridge.

May 9 —

At Los Alamos, the world's first enriched-uranium reactor achieves criticality. Dubbed the **Water Boiler**, the reactor is used to perform chain-reaction and design experiments for the uranium bomb.



Water Boiler reactor

June —

Crisis: Emilio Segrè and his team discover that reactor-made plutonium has a spontaneous-fission rate far too high for a gun-type bomb.



It was in this cabin, one of a cluster of rural buildings some miles from the main technical area, that the historic experiments were made. Shown below are set-ups for the experiment.

July 20 —

Implosion design is given the highest priority. Under enormous time pressure, Oppenheimer reorganizes the Laboratory in a massive effort to create a plutonium implosion bomb.

For safety, the expanded plutonium implosion program was located at S-Site, several miles from Los Alamos.



Starting summer 1944 —

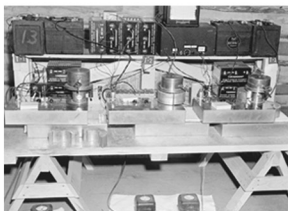
Scientists conduct hundreds of tests to solve the unique detonation problems presented by the implosion design. To measure what was happening inside the nuclear core during an explosion, they used lanthanum-140 as a marker.



Lanthanum-140 is radioactive and required "remote handling."

Late 1944 —

Enrico Fermi moves to Los Alamos and becomes associate director of the Laboratory.



1945 MANHATTAN PROJECT



Even before Trinity, bomb designs and components were tested to see if they could withstand the harsh conditions encountered in the bomb bay of a B-29. Here, a mockup of the plutonium implosion bomb is suspended for a "shake test."



Assembly of components at Los Alamos took place in this wood-frame building.



Hiroshima



February —

First batch of plutonium from Hanford arrives at Los Alamos.

February through May —

Design of the uranium gun-type device is frozen. The Laboratory successfully develops this design into a bomb that can be delivered by an airplane. Scientists are confident the bomb will perform without testing.

March through July —

The crash plutonium-implosion program leads to development of a bomb that seems likely to work but will need to be tested. Oppenheimer chooses a remote area 200 miles south of Los Alamos, near Socorro. He names the test and the site Trinity.

May 7 —

Trinity Site rehearsal: To calibrate instruments, scientists conduct the 100-ton Test—named after the amount of TNT used in the explosion.

July 12–13 —

The high-exposives components of the plutonium implosion device, the Gadget, are assembled at Los Alamos and delivered to Trinity Site, where the nuclear material is added.

July 16 —

Trinity Site: Los Alamos researchers successfully test the plutonium implosion bomb design.

August 6 —

Dropped by the B-29 bomber, Enola Gay, the uranium gun-type bomb, Little Boy, explodes over Hiroshima, Japan.

August 9 —

Dropped by the B-29 bomber, Bock's Car, the plutonium implosion bomb, Fat Man, explodes over Nagasaki, Japan.

The blasts destroys major sections of both cities, killing thousands.

August 14 —

Twenty-seven months after Project Y begins, Japan surrenders.

Late summer —

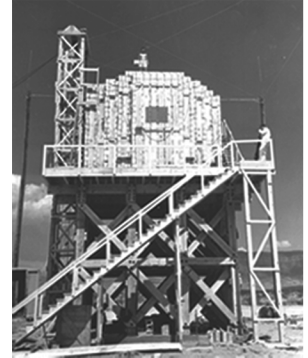
Norris Bradbury becomes the second director of the Laboratory after Oppenheimer and many other Project Y participants leave Los Alamos and return to civilian life.

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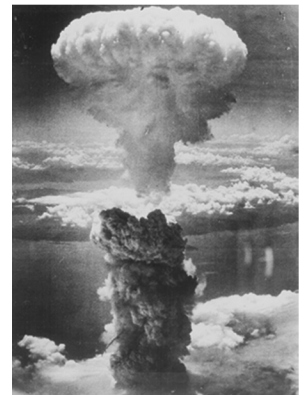
Trinity Site occupied part of the McDonald ranch.



100-ton Test



The world's first nuclear explosion



Nagasaki



Formal surrender ceremony, Tokyo Bay, September 2